

## Technical Summary of Electrolyzed Water Treatment.

An industry installation and heating company recently began promoting a “new” type of water treatment known as Electrolyzed Water. The product is manufactured by a company named Aquaox LLC. The claims are that Electrolyzed Water “is greener than traditional chemical technologies” and can be used in many industries with “superior germicidal, biocidal, fungicidal and sporicidal properties”, and that it “is non-toxic.” In reality, “electrolyzed water” is a method of site-generated chlorine in multiple forms.

Our partner Charlie Hayes, a BioChemist and with 24 years of experience in researching, designing and implementing water treatment solutions for agricultural applications responds as follows:

The use of differing forms of Chlorine in horticulture is nothing new. In fact Chlorine has been the most used disinfectant over the years, for water used in irrigation. There is a great deal of research documenting it’s ability to disinfect irrigation water, some more illuminating than others.

In this research the overriding theme has been “can I get enough reduction in microbial load to provide the security blanket hoped for”; rather than “is this the solution that will produce the healthiest plants.” Changing the focus from the goal of simply killing organisms in water, to providing water which will produce the healthiest plants will also impact our decisions regarding which water treatment technologies are best for your operation. I was asked to review the differences in the electrolyzed water technology and ozone based solutions. There is not a great deal of research on the use of electrolyzed water on plants, most likely because there is already a pretty good body of research on the three compounds that are present in “electrolyzed water”. The key compound, hypochlorous acid (HOCL), is one of the most effective forms of Chlorine for disinfection, but, as with all forms of Chlorine, pH is a key factor in its effectiveness. The system noted, Aquaox, is producing the 3 forms of Chlorine as is typical with this equipment type, and blending them back (acid and a base) to form a neutral blend. The desired pH is 6-7 for the most effective disinfection without off-gassing Chlorine gas, which happens at lower pH.

There are three key issues to consider when using Chlorine in this situation. One is that water pH is key... and all efforts must be taken to prevent the off-gassing of Chlorine gas for safety issues and for plant health. The second is that the vast majority of reports of using Chlorine in irrigation water are on single pass water use, not water re-use with fertilizers in it. When chlorine is blended with water containing fertilizer, specifically nitrates, it produces a number of Chlorinated by-products (Chloramines), all of which are far less effective and which create other toxicity issues, this in addition to the phyto-toxicity issues already present with HOCL. This conversion happens in less than two minutes in all cases I have seen published, usually within seconds.

The third and, in my view, most significant issue with the use of Chlorine in horticulture is the ill effect on plant health and the failure to effectively deal with bio-films. The biofilm issue is often ignored when using Hypochlorous acid because it can help break down biofilms...if in high enough concentrations, for a long enough contact time. But, remember in the case of fertilized water, the HOCL is nearly immediately converted to chloramines and therefore is not a good biofilm eliminator.

All of these Chlorine and Chlorine by-products have one thing in common...they have a negative effect on the beneficial bacteria and root tissue. In hydroponics, for example, this effect is amplified to a great degree since the water is contacting the root tissue directly, not buffered by a growing media or soil. All of this comes to one point. Ozone is the most effective oxidizer available...(much better than any of these forms or any other form of Chlorine). Ozone is the most effective biofilm eradicator and preventer, and its post reaction by-product is very high levels of dissolved oxygen (ozone is 12 ½ times more soluble than oxygen) which is strongly beneficial to the plants root system and beneficial microbes.

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So instead of buying multiple systems which each have their own operation inputs required with significant potential for plant health and personnel health issues if their operation is not controlled correctly, why not employ the best available technology which will produce the healthiest plants which will not only be able to produce higher quality crops but will do so with a much lower risk of disease.

A final note regarding cost, it is important to note that the cost of the electrolyzed water units is not significantly lower than the cost of a comparable capacity ozone skid, but it does require approximately three and a half times more electricity, plus other consumables for water softening and salt. The net operational 5 year ownership would be the same as or higher than ozone and require much more attention with far less beneficial results.

I would be happy to answer any questions you may have about this information.

Charlie Hayes